The Northwestern MILLER

MILLING PRODUCTION SECTION

Flow Sheets and Their Value to the Miller

By George J. Tesarek

The Quaker Oats Co.

The flow sheet, or milling diagram, serves a number of purposes.

It is the basis of a new mill contemplated or going into operation.

It is the basis of reflowing an old milling unit, in replacement of various units of equipment.

It is the head miller's guide, in which all details of the milling process, that is of machinery and flow, are noted in chronological order, and which should be kept up to date without fail.

It furthermore has all equipment indicated as to the number of various machines. Rolls carry the number of pairs, size diameter and length of rolls, corrugating or grinding specifications, differential, spiral and sometimes r.p.m.'s. Purifiers carry size of frame and grit gauze numbering. Sifters — size of machine, number of section, and the flow diagram of each sifter section. Auxiliary equipment, such as dusters, aspirators, conveyors, elevators, etc., are all indicated in a flow sheet. Streams from the various dust collecting systems are indicated where they finally end up.

The cleaning house flow is part of the process, but is usually drawn on a separate sheet.

Conveying systems, various ingredient feeders (Novadel, enrichment, phosphate, malt, etc.) and bulk bins and packer bins are sometimes included in the diagram.

Training Guide

It is helpful to the new miller in familiarizing himself with the new mill; it is his training guide.

The diagram shows all machinery used in the system and the connecting links between operations. Various machines represented by squares, rectangles, circles, cylinders and other symbols, and the flow of stock from one piece of equipment to another are represented by connecting lines with arrows indicating direction of flow. The flow sheet is more detailed than an amateur might think.

Let us review what we sketched out. First of all, in a new construction or a rebuilding job, it is the primary responsibility of the management to determine the capacity of the unit, based on economical conditions. Many subjects must be considered; source of wheat, freight rates and distance from grain center are of prime importance. The probable selling market for the mill's flour and feeds and the freight rate picture connected with shipping these products and by-products—this problem alone carries a magnitude of its own problems. The community and man power availability are also of great importance. This in itself is a good sized subject and when settled, the milling superintendent and milling engineer start their ground work. For instance, let us say it was decided a basic 2,000 cwt. capacity per 24 hours milling unit is to be built for grinding both hard and soft wheat.

Equipment

We must determine the amount of equipment necessary to make this unit produce the best hundredweight of low ash flour for the lowest cost. Then we figure if this equipment can be installed in a given space in the mill building, or if it is a new plant, how large a building would be necessary to make a good operating milling unit. There are very few millers among us who have been fortunate enough to start up a brand new mill, I mean from ground up. There are considerably more of us who had the privilege of starting up a milling unit which was rebuilt.

George J. Tesarek

Back to our equipment line-up. First of all, let us determine the number of linear inches of roll surface for this 2,000-sack mill. Here in the U.S. and Canada most of our mills operate on 7/16 to ⅝" roll surface per cwt. of capacity. In Europe it was about 1" roll surface per cwt. capacity. Today we tend to go to a longer roll surface, while the Europeans are lowering theirs somewhat. So if we figure ⅝" or even a little more, it would be O.K. Let us take the ⅝" per cwt. figure. For 2,000 cwt. capacity plant we need 1,250" of necessary roll surface. Dividing the above figure by 60, we will need 21 stands of 9x30 rolls—this would make 1,260" roll surface. We selected the 9x30 stand because its rolls will be interchangeable throughout the mill. We could have figured 9x36, 9x30 and 9x24" rolls, but it would mean carrying that much more in spare parts.

Taking 40% of the total for breaks, which works nicely, we need 504" for breaks. Divide this by 30 and we get 17 pairs, or 510" of roll surface. Not long ago one of our good friends from Europe suggested even 50% for the breaks. As for reductions, it leaves us with 25 pair 9x30 rolls, or 750" of surface—60% (within .1%).

Therefore, our division would be as follows:

Breaks:	
1B	4 pr. 9x30=120"
2B	4 pr. 9x30=120"
3B	3 pr. 9x30= 90"
4B	3 pr. 9x30= 90"
5B	3 pr. 9x30= 90"
Total	17 pr. 9x30=510"=40%
Reductions:	
1 Sizing	2 pr. 9x30= 60
2 Quality	1 pr. 9x30= 30
1 Mids	5 pr. 9x30=150
2 Mids	4 pr. 9x30=120
3 Mids	3 pr. 9x30= 90
4 Mids	2 pr. 9x30= 60
5 Mids	1 pr. 9x30= 30
6 Mids	1 pr. 9x30= 30
7 Mids	1 pr. 9x30= 30
1 Tail	1 pr. 9x30= 30
2 Tail	1 pr. 9x30= 30
1 LG	1 pr. 9x30= 30
2 LG	1 pr. 9x30= 30
3 LG	1 pr. 9x30= 30
Total	25 pr. 9x30=750"=60%

It would be desirable to make coarse and fine breaks from 2nd to 5th break. If 20 stands were more desirable, then five 9x36 and 15 9x30 stands can be used for the same roll surface, but a little reshuffled.

Next we determine the number of sifters necessary. For our capacity mill we can use 22 sieves to a section. For breaks, the following sifters will be necessary:

1 Break	2 sec. of 22 sieves each
2 Break	2 sec. of 22 sieves each
3 Break	2 sec. of 22 sieves each
4 Break	2 sec. of 22 sieves each
5 Break	2 sec. of 22 sieves each
Break dustings	2 sec. of 22 sieves each
Bran and shorts duster flour	1 sec. of 22 sieves each
Total	13 sec. of 22 sieves each

EDITOR'S NOTE: The key to successful milling is the flow sheet. Why this is so is clearly brought out in the accompanying article by George J. Tesarek, the Quaker Oats Co., St. Joseph, Mo. Mr. Tesarek, who presented the paper from which the article is taken at a recent joint meeting of Districts 3 and 6 of the Association of Operative Millers, concludes by stressing the importance of keeping the milling diagram up to date.

For reductions:

Sizing	1 section of 22 sieves each
2 Quality	1 section of 22 sieves each
1 Mids	3 sections of 22 sieves each
2 Mids	2 sections of 22 sieves each
3 Mids	2 sections of 22 sieves each
4 Mids	2 sections of 22 sieves each
5 Mids	1 section of 22 sieves each
6 Mids	1 section of 22 sieves each
7 Mids	½ section of 22 sieves each
1 Tail	1 section of 22 sieves each
2 Tail	1 section of 22 sieves each
1 LG	1 section of 22 sieves each
2 LG	1 section of 22 sieves each
3 LG	½ section of 22 sieves each
Total	17 sections of 22 sieves each
Breaks	13 sections
Reductions	17 sections
Total	30 sections

or if we use a six-section machine, we need five 6x22 square type sifters of 26 sq. ft. per sieve, or a total of 1,716 sq. ft. of bolting area for the milling stocks, plus three sections of 22 sieves each for patent rebolting and one section of 22 sieves for clear rebolting; therefore, necessitating 1 more 4x22 sifter for rebolting. This rebolter would have 229 sq. ft. of bolting area, giving a grand total of 1,945 sq. ft. for 2,000 cwt. flour—the old yardstick of 2 sq. ft. per barrel.

Purification

Next comes purification. Purifiers in the immediate past in many of our mills were "Cinderellas" so to speak. Today a change is coming about—a trend to European machines is in the air. They are either single, double or triple deck machines, mostly two purifiers mounted in one frame. The triple deck machine has frames of 13¾" or 17¾" width and are 23" in length, with four frames to a single deck. If we use the 17¾" wide frame—3 sq. ft. of cloth per form, or 3x4=12 sq. ft. per single side of machine—we would select six double machines, 144 sq. ft. of area on a single sieve; or if we use our own American purifier, we would use 9 33x96 machines of some 196 sq. ft. of purifier surface. The European machine would have 144 sq. ft. x 3= (3 decks)=432 sq. ft. of grits gauze on frames. Stock is triple cleaned on each passage and repurification is almost nil.

The bran and shorts dusters would

(Continued on page 11a)

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The Place of the Laboratory In the Feed Mill

By Elmer Modeer

Laboratory Director and Nutritionist
Staley Milling Co., Kansas City

A surprising feature of the feed manufacturing industry today is the fact that analytical control laboratories are relatively few in an industry that has shown itself unusually science-minded in applying the latest discoveries in nutrition and other animal sciences, and progressive in materials handling and other production problems.

Yet, aside from very large companies, and the northeastern area, the feed laboratory is the exception rather than the rule, in an industry that, relative to industry in general, is prosperous, optimistic and progressive.

The reason laboratories have not become as common a part of feed production operations as they have in flour milling, for instance, is partly due to the fact that management has not developed an understanding of their potentialities, and the pressure for efficiency has not been the factor in the past that it is rapidly becoming. The other principal factor has been the scarcity of personnel trained both in the profession of chemistry and the technology of the feed industry. The new Kansas State Feed Technology School will perform a great service in providing this personnel for the industry.

A characteristic of the feed industry is that the process of manufacturing feed does not, relatively speaking, add to the raw materials cost to the extent of most industries. A hundred dollars worth of steel going to a watch factory will produce thousands of dollars worth of finished products; the same amount of feed ingredients will produce, at most, about $120 to $140 worth of finished products. Saving a dollar per hundred in raw materials would be insignificant to the watch maker; the same saving to the feed manufacturer would be tremendous.

The feed industry today is not selling ingredients, such as soybean oil meal or wheat gray shorts, as examples, but nutrition, measured in terms such as protein, phosphorus or riboflavin; and the only way to measure these factors is by laboratory analysis. A properly used laboratory is one of the greatest single factors for lowering materials cost, while still maintaining nutritional quality in feeds. Yet a tremendous proportion of the tonnage of formula feeds is made and sold today on pencil-and-paper calculations, a practice that is costly to the producer and risky for the consumer.

It is hard to understand how organizations that diligently pursue and apply every materials handling and labor saving idea in production, run their offices with the most modern and complex accounting machinery, and yet accept—and sell—the factor that accounts for more than two thirds of the cost of the finished product almost entirely on guesswork.

What should a laboratory do in the feed mill? The first point to be realized is that there is nothing automatic about results from a laboratory. Unless the information obtained is put to use by management, it isn't worth anything. A laboratory is of value only to the extent to which the laboratory data is actually applied. This is a function of management, but it is also a responsibility of the chemist to educate and cooperate with management in applying the information. If the answer "yes" cannot be given to the question "Will we be able to do something on the basis of this test?" then the particular test will be a sheer waste of time and money. Undoubtedly, however, a great deal of analytical data in many companies leaves the laboratory and passively fills file drawers in the office because of habit.

Types of Data

For convenience of description, laboratory data can be classed as "police," "pattern" or investigational. The most practical tests made by the feed laboratory are those termed "police" checks. These are determinations that can be made quickly enough to form a basis for acceptance of ingredients or release of finished feeds. On ingredients, the protein test looms large, with such individual factors as fiber on millfeeds, total solids in molasses, carotene in alfalfa, or free fatty acid in meat and bone scraps, as examples. On the basis of such routine, quickly performed tests, the laboratory can act not only as a quality screen but also as a guide to the buyer for acceptable sources of supply and as an aid in setting up specifications.

"Police" checks on production are especially important. Analysis for protein, molasses content, urea, moisture, drugs, such as nitrophenide, nitrofurazone, sulfaquinoxaline or arsanilic acid, can all be completed before shipment is made, in most cases. They are the basis of real quality control, the "bread and butter" work of the laboratory.

"Pattern" type testing involves assays that cannot be completed quickly enough or performed often enough to serve as acceptance or rejection factors, but which are used to get a picture of the normal behavior pattern of numerous factors in the production operations. In addition to the tests used for policing, such factors as fat, fiber, ash, calcium, phosphorus,

Elmer Modeer

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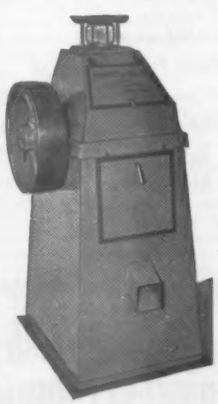

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manganese, sodium chloride, carotene and vitamin A, riboflavin, when run repeatedly enough, establish a statistical basis for determining proper quality control. Adequate and safe but not excessive overages for critical materials, proper mixing times, sufficient "set back" between feed changes and other factors affecting the uniformity of products, are typical of the problems "pattern" checking helps solve. In fact this "X-ray" picture of plant operations is limited only by the chemist's ingenuity and the cooperativeness of production management. Another important "pattern" study concerns storage and stability of products. The history of moisture changes from mixing through prolonged storage under different conditions, and carotene retention under the same conditions furnishes important data.

In addition to police and pattern tests, the laboratory performs a variety of services of a more long term and investigational nature, which varies greatly in scope among different companies, depending upon how much testing and "research" is being done.

An important, but often misunderstood fact is that fundamentally the analytical laboratory in the feed industry is not a research laboratory, signs on most lab doors, notwithstanding. What is termed research in the feed industry—which is largely testing rather than true fundamental research—is primarily biological, involving comparative feeding studies of one sort or another. In such procedures, the laboratory is a tool, as in the case of purchasing or production, but only a tool.

If a study is made, for example, of the effect of phosphorus levels in growing chicks, it is necessary that the laboratory assay the feeds to be sure that the levels are actually as intended, and the laboratory might run chick bone ash tests at the end

INSIDE SCIENCE

White Flour in the U.S.A.—

Enriched* with Vitamins and Iron for Better Nutrition

by Science Writer

This article is one of a series devoted to the enrichment of family white flour, white bread and rolls, corn meal and grits, macaroni products and white rice.

The enrichment of family white flour with thiamine, riboflavin, niacin and iron by American millers is a major success. It has made great contributions to better health in the United States by improving a staple food.

Since the start of the program in 1941 by millers, voluntarily, the evidence is conclusive that enrichment not only has reduced the number of cases of certain dietary diseases but also is promoting the mental and physical vigor and well-being of the U. S. population generally. Because of its demonstrated value, the principle and practice of enrichment have been applied to other foods made from grains: corn meal and grits, white rice, macaroni, spaghetti, noodles, pastina, farina—and, of course, to white bread and rolls.

Doctors and diet experts have long supported white flour enrichment. The Council on Foods and Nutrition of the American Medical Association and the Food and Nutrition Board of the National Research Council are on record as endorsing the practice.

The legislatures of a majority of the States plus Hawaii and Puerto Rico have enacted laws which make mandatory the enrichment of all family white flour, as well as white bread, sold commercially in those areas.

American homemakers, too, favor foods they know to be enriched—a fact demonstrated by surveys. They look for these words on package labels: "Enriched with vitamins and iron for better nutrition."

What Is Enrichment?

It's an axiom in the milling industry that consumers want beautifully fine, white flour. When wheat is milled and processed to get the white flour which the public demands, vitamin and mineral values are unavoidably lost.

Enrichment restores to white flour the following important vitamin and mineral factors: thiamine, riboflavin, niacin and iron. Calcium also may be added as an optional ingredient. The process is simple and inexpensive. A mixture of the vitamins and iron is fed into the flour stream during processing. This insures that the enriching ingredients are spread evenly throughout the flour.

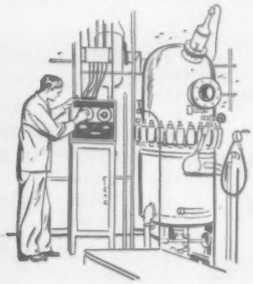
The U. S. Food and Drug Administration has established standards which white flour must meet to be properly labeled enriched. The requirements, in milligrams per pound, are:

	Min.	*Max.*
Thiamine (vitamin B_1)	2.0	2.5
Riboflavin (vitamin B_2)	1.2	1.5
Niacin (another "B" vitamin)	16.0	20.0
Iron	13.0	16.5

(In Canada, too, the same standards have been set for enriched white flour through the amendment of the Food and Drugs Act.)

Vitamins Are Made

The science of chemistry is so advanced these days that many of Nature's complex substances can be "duplicated" in the laboratory. This has happened with many vitamins. First, the chemical composition is learned. Second, the pure substance is isolated. Third, a "duplicate" is made by synthesis. And fourth, the laboratory techniques are extended to large scale operation.



The manufactured "duplicate" is identical chemically and in biological activity with Nature's own product. A vitamin is still a vitamin regardless of its source. So efficient is large scale manufacturing that vitamins are sold at a lower cost than if they were extracted from natural sources.

The Hoffmann-La Roche people make top quality vitamins actually by the tons. To do this they use amazingly complex processes with scientific production controls and the latest equipment which fill buildings each a city block square and many stories high.

Reprints of this article, and all others in this series are available without charge. Please send your request to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The watermills are gone. Today's needs require today's methods. How sensible it is that millers across the nation restore health-giving vitamins and minerals through enrichment.

*Webster's Merriam Collegiate Dictionary includes this definition of "enrich": "to improve (a food) in nutritive value by addition in processing of vitamins and minerals".

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of the experiment, but the problem under investigation is fundamentally nutritional, not analytical.

It must also be understood that the laboratory is not necessarily, or even usually, the nutrition, formulation and "research" department. Most feed nutritionists have come into the industry with degrees of an animal husbandry background, such as poultry science or dairy science, to which chemistry is incidental. The number of nutritionists with primarily chemistry or biochemistry backgrounds, with "animal" training incidental, are fewer. Where the laboratory and nutrition departments are separate, as they are in large companies and even most smaller ones, management quite frankly may be faced with a personnel problem. The scientific responsibilities — and authority and prestige—must be clearly defined, because complete cooperation is essential. If laboratory findings are to be translated into money saving action, perfect coordination between chemist and formulator is essential.

Companies interested in potential laboratory installations are keenly interested in costs. The minimum cost of a laboratory capable of making most, if not all, of the tests mentioned here, will be about $5,000, with housing and installation extra. Recently the Association of Scientific Instruments Makers, at the request of the National Candy Manufacturers Assn., made an estimate for the equipment for a minimum quality control laboratory for that industry and arrived at the same figure.

This laboratory will be adequate for the smaller mill—15,000 to 50,000 annual tonnage, while the medium class—50,000 to 150,000 annual tonnage, will usually need about $8,000

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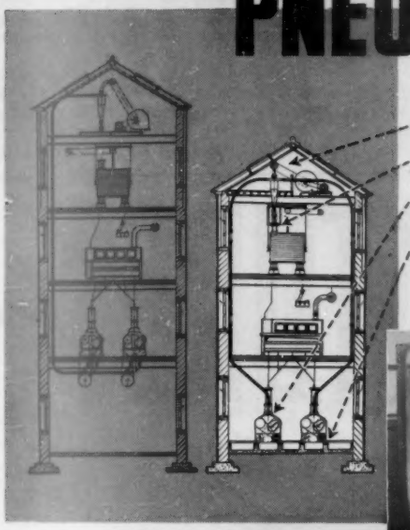

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to $15,000 in equipment. It is a common failing of management inexperienced in laboratory problems to under-equip, or rather to over-estimate the capacity of laboratory equipment. Even with the cost of scientific equipment being high in comparison with regular equipment, it is cheap in comparison with laboratory labor costs. A two-unit fat apparatus, for instance is a nuisance, even in the smallest laboratories. Probably three fourths of the laboratories with 6-unit Kjeldahl protein outfits really need 12 units, and most of those with 12 would profit by 24-unit setups. The speed and flexibility of adequate equipment soon pays for itself.

How far the feed mill should go beyond the program outlined here would better be determined by evolution from such a starting point. In general, the maxim, "Run nothing that cannot result in action" should be observed. Such procedures as microbiological assays, vitamin D chick tests, amino acid paper chromatography have a place in the larger organizations, particularly the multiple unit companies with central laboratories, but unless the volume of purchases of such things as vitamin D oil or vitamin B_{12} involves great quantities, the many reliable commercial laboratories will be more economical, for the volume of such tests that the average mill will need.

It is difficult more than to generalize in estimating salary costs for feed laboratories. As a rough guide, however, a survey conducted annually by the American Chemical Society shows that last year, graduating chemists with bachelor's degrees and without experience were going into industry at an average of $350 per month. Enough experience to warrant assuming charge of a laboratory would suggest a minimum of at least $400; larger laboratories would imply larger salaries, but capable technicians can be trained for routine operations, lowering the per sample average cost.

One of the common mistakes feed companies starting laboratories make is an improper sampling set-up. Sampling is a critical factor, and the source of many errors. It should be independent of production and under the control of the laboratory, but usually the sampler is selected because a broom can be left with less trouble than a panel board or desk, or because the one selected is a good man with a car door. The American Association of Cereal Chemists Feed and Feedstuffs Evaluation committee is carrying on a study of sampling techniques, and its findings should be a guide to industry practice.

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these expenditures? If all the savings of laboratory control showed up on the company books as specifically as telephone bills or insurance payments, a great many laboratories would be inaugurated about as rapidly as the personnel could be found.

On the subject of direct savings on ingredient costs, estimates must be made with cautious reservations, since conditions vary so greatly, but for an average mill, with average safety-factor formulation and employing as a guide one of the current popular feed ingredient analysis charts, a saving of from $1 to $2 per ton is possible on protein alone. Savings on vitamins through "pattern" tests, savings on mixing time or other production factors represent savings of varying degrees of tangibility.

Irrespective of direct financial returns from quality control, however, there is a necessity for uniform and efficient production of formula feeds. A large and growing proportion of the buyers of feed today are aware of the efficiency of our products to the second decimal. For this type of customer there can be no guess work for long. Control at every step of the way is essential to retain the business of this growing class of feed customers.

The answer to the question of how small a mill can afford a laboratory, depends upon many factors—but consider that a mill making just 60 tons per day is buying annually about $1 million worth of complex and varied raw materials, differing widely in price, and selling them for a relatively small margin over the raw material price. It can ill afford to gamble either on the quality of its purchases or the accuracy of its blending.

The relatively free and easy days for the rapidly expanding feed manufacturing industry are disappearing. Bulk handling, pallets and fork trucks, paper bags—all point to the race for cost saving and efficiency. The days when margins could be maintained to cover a multitude of sins of production inefficiencies, extravagant promotion costs and careless ingredient buying, and still show a profit, are drawing to a close. Only the efficient can remain in the race, and no one selling nutrition can afford to guess about it.

One of the brightest prospects for the future of the feed industry is the fact that its Feed Technology School will soon be making available to the industry men capable of operating the laboratories against a background of thorough training in feed technology.

A virtual bottleneck of the lack of feed-wise chemists will be broken, just as the Milling Industry School, of which it is a part, has done for the flour milling industry during the past quarter century. The benefits to the entire feed industry will be incalculable.

—BREAD IS THE STAFF OF LIFE—

Superintendents' Group Will Meet June 20-25

CHICAGO—The 26th annual convention of the Grain Elevator and Processing Superintendents will be held June 20-25, with headquarters at the Royal Alexandra Hotel in Winnipeg.

Plans for the convention were announced by Leslie C. Irwin, Searle Grain Co., Ltd., Fort William, president of the group.

The meeting will be called the "good will" and "family" convention.

One of the features of the conference will be a 465-mile trip to Fort William-Port Arthur, big grain storage center.

Bolting Cloth Apertures and Modern Grinding Practice

By John Speight

EDITOR'S NOTE: John Speight is a British milling engineer who has had considerable experience in both the U.K. and Western Germany. He has contributed a number of improvements to current milling practice and in his writings for the technical press he covers a wide field of interest. The article is reproduced from Milling, the Liverpool, England, publication.

Flour manufacture is something of a "hit-and-miss" affair, governed by rule-of-thumb methods. It was bequeathed to us like this and we had to accept it. Change will always be slow in this industry. It cannot be otherwise and for many reasons, the chief of which is that flour converted into bread is one of the principal forms of nutrition for a great many people. Millers, therefore, have to be extremely careful in attempting to introduce change in any shape or form, a condition that makes most of them hesitate before committing themselves to changes that might not prove satisfactory.

Nevertheless, steady progress has been made. Flour milling is moving slowly into the realms of scientific control and application. We have automatic flow control of weighing,

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blending, packing, pneumatic conveying and separation, remote control for moving, storing and delivery of finished products. Yet, we still cling in the main to rule-of-thumb methods to control our grinding process, which is acknowledged to be one of the most important processes in the manufacture of flour.

It is true that in many mills some form of grinding control is practiced with the aid of test sieves, especially on the break rolls, but it is only in a few instances that the constant sieving test has superseded the rule-of-thumb and finger-grinding control, especially on the reduction rolls. It is surprising to find that practically no attention has been paid to this subject by writers of text books, who certainly describe how sieve tests can be carried out, but who fail to mention the importance of grinding control by constant sieve tests.

Certain information about grinding can be obtained by feeling or rubbing the material between the thumb and fingers, but this sort of information is liable to errors of judgment. It is not definite enough to meet modern demands, and as such can have no place in a future mill. Definite information cannot be obtained by merely feeling or rubbing material between the thumb and fingers; the only dependable way is to make accurate sieve tests and subsequent analyses in order to provide a permanent record. The judgment of the operator may change, as it frequently does, or if there is a change of operator he has no knowledge of what has previously been considered a satisfactory performance.

Discovery came to mankind first by chance, later by trial and error; today it is chiefly as the result of deliberate and direct investigation. Scientific knowledge enables us to promote theories or so-called laws which can govern a particular process of manufacture; the knowledge is definite and the outcome certain. The more formulae or so-called laws, the better is each individual process understood. In the case of grinding and crushing minerals, it was not until Rittinger and Kick laid down a so-called formula that we were even aware of what this process implied or even how it could be interpreted.

Thumb-and-Finger Test

In the manufacture of flour, grinding has received the least attention of all in the efforts that have been made to put the industry on a scientific basis comparable with modern demands. The control of grinding today, in the main, is practically the same as when it was first introduced in its present form about 100 years ago.

This time-honored custom of testing the grinding between the thumb and fingers may have served us fairly well in the past, but today we demand something more definite, not liable to the failings of the human element. With due respect to the operatives, no two men feel alike in this personal touch, especially after one of them has (say) spent his leisure time in strenuous gardening work before taking control of the grinding floor. This is no reflection on the operatives concerned; it is the system that is at fault. It is completely out of place in a modern mill. There is no doubt the industry is fully aware of the importance of substituting something more in keeping with modern requirements to take the place of this rule-of-thumb method now employed; the difficulty is in finding something really suitable which will admit of few errors.

Bearing Temperature

There have been many attempts to control the grinding operation by means of indicating or recording the temperature of the roll, but here again there are serious disadvantages to this procedure, chief of which is the uncertainty and irregularity in bearing temperature, which naturally affects the temperature of the ground product. In an effort to solve this problem, I introduced the first completely enclosed and streamlined form of roller mill. In this machine provision was made for oil reservoirs with oil pumps attached which circulated the oil continuously through the bearings and reduced roll temperature, but even in this case the variable heat transmitted from the bearings rendered grinding control by temperature unsatisfactory. I found similar conditions obtained when the temperature of the stock leaving the nip of the rolls was indicated. Therefore, I came to the conclusion that temperature control of the grinding operation could not be regarded as a reliable guide.

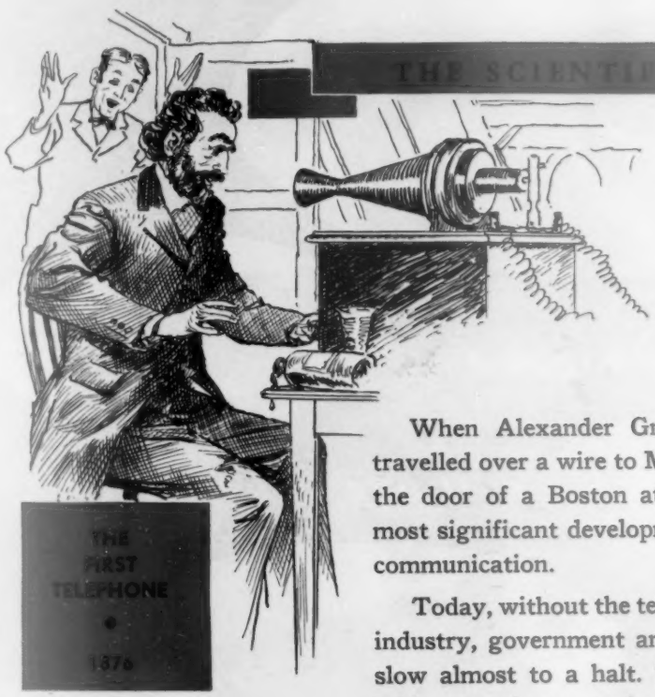
The reason why all control of grinding operations should be scientifically conducted, is that the grinding equipment has a point of the most desirable production. To be above or below this point is bound to reduce the efficiency of the plant; insufficiently ground products are bound to be unsatisfactory and overground products equally so.

In order to maintain the most desirable point of production, it is essential to carry out regular routine sieving tests with clockwork regularity on all grinding processes to obtain granulation curves which can serve as a useful guide in this work.

Particle Size

When working with finely divided materials such as flour, it is necessary to have a knowledge of the size of the particles at various stages in the manufacturing process, as size is one of the most important properties of all solid materials.

Flour is made from grain that is



When Alexander Graham Bell's voice travelled over a wire to Mr. Watson in 1876, the door of a Boston attic opened upon a most significant development in world-wide communication.

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Mrs. America isn't a miller . . . and she isn't a chemist. But she certainly is an expert in her own kitchen. She *knows* when a flour is up to par . . . and when it isn't. For 16 years, Mrs. America has shown her preference for self-rising flour and corn meal made with V-90. So, if you want to keep your customers happy . . . insist on V-90, the only time-tested phosphate you can buy!

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V-90 did the same thing for self-rising corn meal. It opened up entirely new sales opportunities for many mills. Prior to V-90, self-rising corn meal was unsatisfactory because of difficulties encountered with shelf life. Today, Mrs. America *knows* she can expect perfect corn bread every time.

Yes, every miller has to be an expert . . . not only in his knowledge of milling, but he must exercise expert judgment in the selection of phosphate. Pleasing Mrs. America day in and day out is no easy task. And remember, V-90 *is the only phosphate* that Mrs. America, the *real* expert, has approved.

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ground and classified according to the size of the particles, most of which are so small that unless observed in groups they are invisible to the naked eye. The smallest particle that can be seen by the naked eye is 10 microns. Particles of two microns and under do not settle easily, they will remain airborne for a long time, their settling rate in still air being approximately eight inches or less per hour.

To obtain a full knowledge of these particles which is the result of the grinding process, it is necessary to use the sieve test, which gives a true picture of the effectiveness of the grinding operation, irrespective of temperature or other effects. Much information can be gained from this test and it is a very simple operation.

In connection with the test, meshed covers, or bolting cloths as they are usually called, are used. These bolting cloths are identical with the covers used on the dressing machinery and have aperture sizes of varying degree in width and area, so much so that I am inclined to regard them as antiquated in conception and as thoroughly outdated as the rule-of-thumb grinding control. I should like to see some much needed improvement effected in all types of silk or synthetic fibre bolting cloth appertures, both in width and area.

Origin of Bolting Cloth

Bolting cloths have had a good long run. Their origin is lost in the mists of antiquity, but bolting cloths as we know them, woven from silk threads, are of comparatively recent origin. It was in the early part of 1830 that Peter Anton Dufour, employed by a Swiss firm of silk manufacturers, traveling in Holland, paid a visit to the factory of Le Grand & Belain in Haarlem, who at that time were manufacturing a very coarse bolting cloth of wool or horsehair. Dufour came away much impressed by the possibilities of manufacturing this type of cloth in silk, and in due course he invented a loom which enabled him to weave a comparatively durable silk cloth with a square mesh, and also to produce it in a range of numbers never attempted previously. It was Dufour's invention which paved the way for the production of a much improved quality of flour than had previously been possible.

The very high standard set by the manufacturers of bolting cloths in those days has been faithfully preserved and followed down through the ages. In course of time, a system of numbering the cloth according to the meshes in a given measurement was adopted. Some time later, when science entered the industry, doubt was expressed that the numbering of the silk and the size of the mesh did not correspond to modern requirements and should be put on a better basis. Different grades and strengths of bolting cloth began to appear, such as standard X, XX, XXX, which in most cases had a mesh aperture of different size. This naturally led to a certain amount of confusion, and it was not until Dr. Haltmeier, the famous German scientist, devoted a considerable amount of time and effort to studying the problem that he was able to issue definite information regarding the mesh aperture size of the different grades of cloth. Haltmeier was also responsible for introducing the now well-known and universally acclaimed graph or curve, known as the granulation curve; his work in urging millers to be guided by the mesh aperture rather than the number of the cloth was of inestimable value to the industry.

Mesh Apertures

Anyone who has been engaged in research work in flour milling must have at one time or another been confronted by the problem of mesh aperture size. The present system of numbering the aperture does at times lead to confusion and waste of effort unless one is prepared to check each individual cover. For instance, there is a No. 7 standard silk with a mesh aperture of 0.0088 inch, a No. 7 X with 0.0085, a No. 7 XX, 0.0082; then we have a No. 7 XXX with 0.0091. This is not an isolated case for there is a No. 12 X and a No. 13 X silk manufactured by different firms which have an identical aperture size of 0.0042 inch, so that unless covers are very clearly marked confusion is bound to occur. One would have thought the manufacturers of these cloths would have attempted to maintain a constant aperture size for each individual number of cloth, irrespective of grade or quality. Of course, there may be very good reasons why this cannot be done.

The manufacturers of synthetic fibre cloths, such as Nylon, Perlon, etc., apparently have made an attempt to improve upon the numbering of their cloths by substituting for the former number a figure indicating the width of the mesh aperture in microns, but here again some confusion has arisen owing to the fact that some manufacturers of these synthetic cloths have adopted varying aperture sizes said to equal the number of silk cloth. One manufacturer markets a cloth with a mesh aperture of 100 microns, claimed to equal a No. 13 silk, another make offers one with a mesh aperture of 103 for the same number, whilst for a number 9 silk we are offered a range of mesh apertures varying from 178, 180 to 188.

All this is somewhat confusing and

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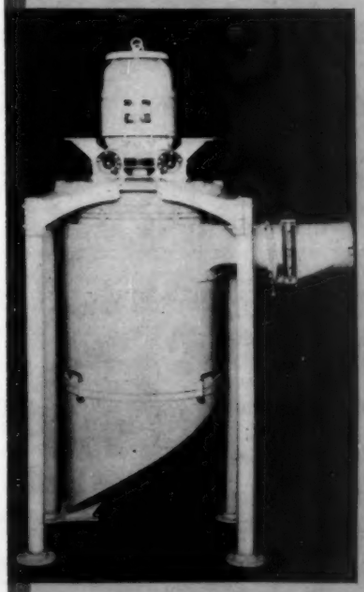

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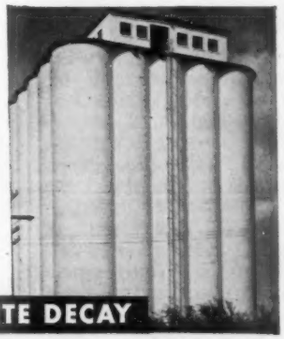

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can only lead to errors unless great care is exercised in checking the mesh aperture. It certainly appears as if the manufacturers of these synthetic cloths have attempted to follow on in the wake of the silk cloth manufacturers by making their cloths as near as possible to existing standards. What a wonderful opportunity occurred for the manufacturers of these synthetic cloths to have adopted Rittinger's suggestion, that the mesh apertures should be graduated in succession to form a geometrical progression. One must acknowledge that the indentification of these synthetic cloths by the mesh aperture size stated in microns is a great improvement on former methods, but even this improvement falls far short of what is going to be required in a scientifically controlled flour mill. Likewise, if the numbering of the mesh aperture is open to improvement, so also is the ratio between the different numbers of mesh apertures; in fact, there is no ratio existing between the various numbers of silk or synthetic cloths, which is largely the result of a legacy handed down from a bygone age.

The manufacture of bolting cloths, whether of silk or synthetic materials, without a fixed ratio between the apertures of the preceding or following number, is a state of affairs similar to having a foot rule with no relation between the smaller divisions.

Rittinger, in his work on grinding and crushing materials, recommended that a ratio between the different sizes of mesh aperture used in separating the finished products should be adopted. This, of course, is no new suggestion, for it was over thirty years ago that Rittinger suggested that the mesh aperture width should be governed by geometrical progression in the fixed ratio of the square root of 2.

It is rather surprising that so little attention should have been paid by the milling industry to these suggestions, for after all separating by size is on a parallel in both industries, milling grain or minerals. One American firm of woven wire manufacturers did adopt his suggestions and they offer this type of wire cloth with a fixed ratio between the sizes.

A great advantage of the Rittinger method of sizing is that by skipping every other size, you have a ratio of width of 2 to 1, by skipping two sizes you have a ratio of 3 to 1, and by skipping three sizes you have a ratio of 4 to 1. In this way, it is easy to adopt a different ratio without having to resort to a lot of calculations.

Of course, one might be tempted to inquire why it should be necessary to manufacture bolting cloths having a standard mesh aperture with a fixed ratio between the various sizes. The answer to this is that the present system of manufacturing and numbering bolting cloths which have no definite relationship existing between the various sizes does not conform to modern requirements; it hinders the introduction of new methods of grinding control which will have to depend on the accuracy of mesh appertures and the demand that a certain mesh is just that and nothing more.

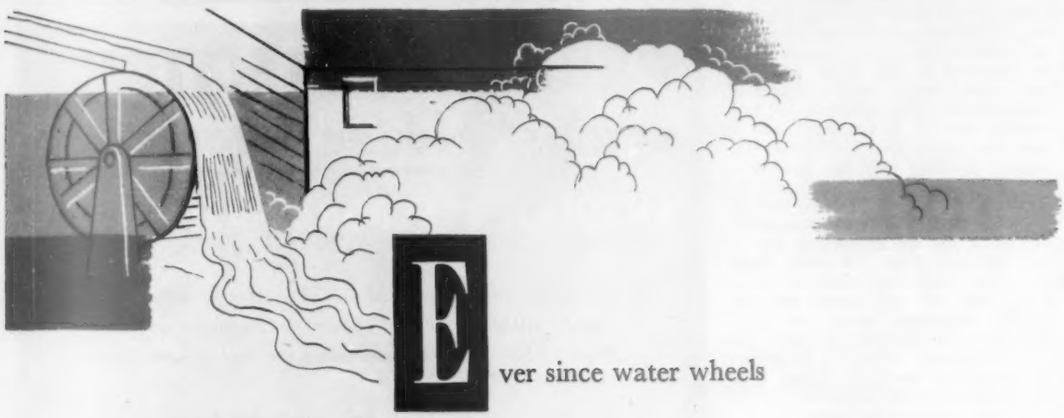
The variation in the comparative openings of different grades of silk and synthetic cloths produced by various firms adds somewhat to the confusion. If the manufacturers could be persuaded to produce these cloths with mesh apertures of a fixed ratio, it would greatly simplify the formula of test work. The milling industry could then possibly adopt a universal method of testing products similar to that employed in the malting and brewing trades, whose conventions stipulate the mesh aperture, the grinding and sieving time for carrying out routine work, etc. The advantage of this co-operation is that in whatever part of the world tests are undertaken, the results will be on a comparable basis.

I suggest that it is only by adopting a method of carrying out regular routine sieve tests and subsequent analyses, and the consequent production of granulation curves, that the grinding operation can be maintained at the highest possible point of efficiency, and in this way make certain that the grinding process is maintained at the most desirable point of production.

Another point in favor of adopting a mesh aperture size with a fixed ratio between the sizes is that it would then be comparatively simple with the aid of a graph or chart to find what aperture size is required to pass or retain a certain percentage of the product.

Out of Step

To manufacture bolting cloths with a confused jumble of aperture widths and areas is somewhat out of step with modern requirements, and should be replaced by something more in keeping with scientific progress. Today's manufacturing methods demand the application of science and the substitution of definite knowledge for the rule-of-thumb method. The manufacturers of bolting cloths can help greatly in this respect.



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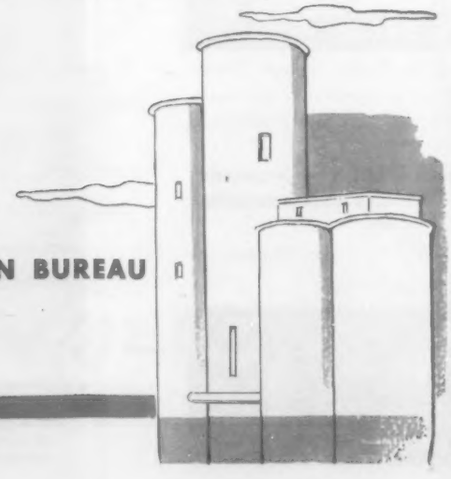

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FLOW SHEETS

(Continued from page 1a)

be No. 3 Forster machines, and bleaching agitators of Economist or similar design.

With all the above work out of the way, we are ready to proceed to draw up the flow sheet. Each passage on breaks and reductions must be determined, how many separations it will have, and what cloth numbering it will carry. We must visualize what hard wheat will do against how soft wheat will behave on this mill.

All scalps and throughs of each and every sifter must be properly indicated as to where they go. If a combination mill, it is well to consider dual flouring sections for each mids passage and the tail-end streams. This permits the proper use of the second cuts flour on soft wheat and valving these same cuts to the following sections when grinding hard wheat. Usually 10-XX and 11-XX are used in place of 7 or 8-XX of dustings.

One pitfall must be watched and that is the one of "run-arounds." Sometimes these do creep in.

All elevators are indicated as visualized. The mill engineer goes to work on his machinery layout plan, which includes a layout of every floor in the mill and his side view elevation. He must position his equipment, that is rolls, so they flow by gravity to elevator and from elevator to sifters without conveyors, but sometimes this is impossible. Yet many mills have, figuratively speaking, miles of unnecessary conveyors in the layout due to poor planning. Somewhat of a different approach can be made when using pneumatic conveying. For instance, one of the country's latest corn mills has all principal machinery—that is, rolls, sifters and purifiers, all on one floor due to the pneumatic system of conveying.

Last but not least, the bleaching agitators, various feeders used on malt, phosphate, Novadel, enrichment bromate, or any other ingredient that will be fed into the finished flour must be properly located. The flour rebolting system is also very important. If our mill is to be equipped with bulk storage bins, flour should be weighed by continuous weighers to bins for keeping close watch on our yields. We should know the amount of wheat to the mill, and with the above mentioned weighers on flour should be in position of close control over yield.

Results

Successful milling cannot be done except by glancing over a diagram; it is coupled with the intimate knowledge the miller has of the mill that produces results. These results are the ones our individual management watch and by these they score our work.

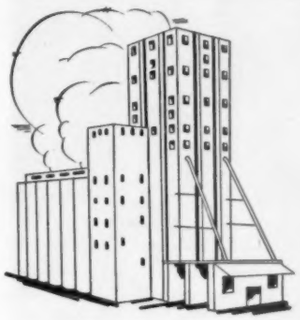
The work of the head miller is getting more complex, with many other phases of importance, such as labor, public relations, sanitation, economics and others.

We have touched the highlights of an imaginary 2,000-sack mill, and looking about the country today, we can see quite a large number of mills designed by the departed Mr. Ziegler of Nordyke & Mormon of Indianapolis, which were designed for about the old yardstick of 1,000 to 1,200 bbl., with roll surface figured at 1¼" per, which are in reality mostly running on ⅞". Mr. Ziegler's calculated roll surface of 1,250 to 1,500 in. was to produce 2,000 to 2,400 cwt. per 24 hours, and is in reality today turning out 40% more flour than originally designed. So the 2,000-sack mill is turning out 2,800 sacks and the 2,400-sack mill is in the neighborhood of 3,360 sacks per day.

It is common knowledge that ⅞" roll surface per cwt. of capacity will give us a definite yield improvement and ease of milling control.

The European miller with 1" of rolls per cwt. can yield 80% flour. The prices of low grade flours compared entered into the American milling picture, and a yield of 72% is standard; but improvements up to 75% extraction today are not out of the question. For intelligent study of any matter pertaining to the mill, it is necessary to keep all details in our flow sheets up to date. We are living in a busy world, but how many millers here have weighed up every stream in their mill and then studied these results? You would be surprised at some results you receive.

In many mills and some of them even larger units, flow sheets have not been brought up to date. Somewhere in a conversation not long ago, an ex-miller friend of mine mentioned the fact that many a milling diagram has not been corrected in some instances since the mill was started up new. Some of these mill flows are carried in the headmiller's head. Therefore, I would like to end this discourse with a question: "Has your flow sheet been brought up to date lately?"



COULD YOUR FUMIGATION RESULTS HAVE BEEN BETTER?

Grain fumigation, with occasional exceptions, is pretty well over for this crop year. So this is a good time to review your past season's treating. Are you satisfied? Were results good? If not, why not? Unless you know the reason, the same thing could happen again.

Many people think that the fumigant itself is just about the whole show in successful fumigation; that you buy it, send it upstairs, and after that it's automatic. If results aren't right —then, naturally, it's the fumigant.

Well, we've always pointed out that different types of fumigants differ markedly in adaptability and practical effectiveness. But what we're emphasizing now is that even a good grain fumigant is only one factor in an insect control program.

What other factors should be considered to help your fumigant give best results?

First, no grain fumigant will do a really good job if grain condition is "off". If condition is just a little "off", the fumigant will be handicapped. If it's badly "off"—as indicated by rising temperatures—you'll almost certainly have poor results. Why? Because you're depending on the fumigant to reach and penetrate each kernel. Well, it just won't do it when the grain is heating and giving off a lot of carbon dioxide. The remedy? Run the grain and get it back in shape before trying to fumigate. Or, if you can't do that, pour the dosage to it—extra dosage. But extra dosage is a poor second choice.

Next, do you have any grain handling or structural features that will prevent proper application or violate fumigation principles? For instance, lack of access to the grain stream; ventilators or fans that pull the gas out of the bin; extra-deep bins calling for special application methods. Such problems should be anticipated and corrected before treating starts.

Next, how about treating personnel, the human element? Do you really know that correct procedure is being followed, or do you merely assume it is? Do you ever go upstairs during treating? Do you give your upstairs man any help—or more than casual instructions? Does he have too much other work to do to give proper attention to treating? Does he have the stuff to work with? Does he have a gas mask handy?

Next, are you treating "in time", either preventively or while infestations are light—before gradual heating and condition factors have begun to take over? With insect grading and flour mill attitudes on high fragment counts the way they are now, early treating pays off. Besides, the bugs are twice as hard to kill if you wait too long.

It's now time to consider the fumigant. Is the one you're using really okay on fire-hazard, human health, plant safety and residual effect on the grain? Is it effective or do you have to figure on re-treating if you store the grain for months? (You shouldn't.) Is it economical? Are you confusing a low per-gallon price with low unit cost? And above all, does your fumigant have the adaptability to meet all your conditions?

Next, adequate dosage. A good rule is: at least as much dosage as the fumigant manufacturer recommends; more under any conditions you recognize as tough.

Finally, proper application. Do you really know the recommended methods of application? (When we investigate treating failures, we often discover wide departure from our basic recommendations.)

In short, a review of your whole grain fumigation program now can improve next season's treating results and do so at a lower cost.

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This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

No. 5157—Pallet Loader

A new pallet-loading machine has been announced by Alvey Conveyor Mfg. Co. The firm describes the new stacker as operating on a suction-pick-up principle which lifts the units in much the same manner as an electromagnet handles ferrous materials. The machine is fed from a conveyor line and the pattern-laying is push-button controlled by an operator. A

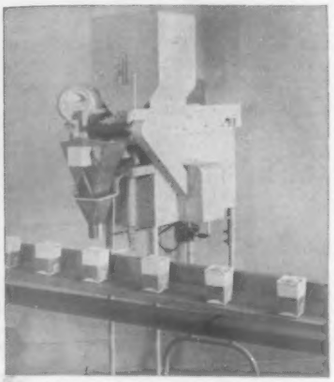
wide range of stacking patterns may be obtained. The firm's announcement states that, "In palletizing multiwall bags, for example, the machine will handle an average of 12 one hundred-pound bags per minute, discharging them onto either of two pallet stations. The machine is equally suitable for unloading pallets and feeding packages onto a conveyor line." For more complete details check No. 5157 on the coupon and drop it in the mail.

No. 5162—V-Belt Catalog

V-drive selections, using new horsepower rating and improved rating techniques, as adopted by Multi-V-Belt Drive & Rubber Manufacturers Assns., are available from a catalog called Engineering Guide 50-B, published by the Fort Worth Steel & Machinery Co. Simplified formulas for standard quarter-turn and V-flat drives are augmented by tables of drives in all belt sections which have been compiled for quick selection of drives of required ratio and speed. This bulletin also contains engineering information on other types of V-belt drives. Check No. 5162 on the coupon and mail it to secure more information.

No. 5133—Weighing Machine

The Trescott Co. has added to its line of prepackaging equipment the "Trescomatic," a unit which handles any free-flowing or semi-free-flowing material. It has four types of discharge attachments so that paper bags, plastic bags, boxes or canisters may be filled. The range of weights



is from 8 oz. to 25 lb. The unit can fill up to 30 packages per minute depending on the size and kind of material, it is claimed. Company spokesmen said the unit is in use for meals, fertilizer, chemicals, and seeds. To secure more complete information check No. 5133 on the coupon and drop it in the mail.

No. 3663—Small Fork Trucks

"Why the Small Fork Truck?" is the title of a new, illustrated, 28-page treatise written by Nathaniel Warshaw, manager of the materials handling division of Market Forge Co. It is available without charge in its second limited edition. The treatise describes how a small power fork truck can be used in upper story installations and for loading and unloading motor trucks, where floor or spring capacities make it impossible to use heavy fork trucks. It illustrates in simple language and graphic pictures and diagrams, the basic design principles of power fork truck construction. Such topics as aisle and pallet sizes, stacking and capacities are included. To secure the publication check No. 3663 on the coupon and drop it in the mail.

No. 5158—Scalper

The addition of a new reciprocating scalper to its materials-handling line has been announced by the Strong-Scott Mfg. Co. Called the Power-Flo, this sieve type scalper incorporates the use of positive drive action to remove foreign matter from feed or whole grain. A special model for sizing pellets and crumbles is also available. A high-speed reciprocation motion is transmitted to the screen bed through an eccentric counter-balanced drive. This ball-bearing mounted eccentric is counterbalanced to minimize vibration. A 220/440, 3 phase, 60 cylcle motor is included with the unit. The scalper is of steel construction (with standard wood shoe or optional steel shoe); available in 24, 36, 48 and 60 in. widths. The three models include: A single screen, a double screen and a special pellet-crumble model. Special sizes are also available when required. To secure more complete details check No. 5158 on the coupon and mail it.

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- ☐ No. 5133—Weighing Machine
- ☐ No. 5157—Pallet Loader
- ☐ No. 5158—Scalper
- ☐ No. 5162—V-Belt Catalog

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Importance of Inspection in Sanitation

Inspection is an integral part of any sanitation program and because of its importance it is essential that the procedure be thoroughly worked out. Moreover, the person doing the inspection work should be carefully chosen, for his work will form the foundation of the program.

These fundamentals were laid down by Glenn O. Munger of the Industrial Fumigant Co., Kansas City, in a recent issue of his company's sanitation service letter.

Mr. Munger stresses that the inspector should be interested in his work for he will perform the job much better than one who is only slightly interested, or who has no interest whatsoever. The inspector should also have imagination, and should be able to apply this imagination to his work. There are many problems encountered which can be more easily solved with the use of a little imagination and ingenuity. The qualification of having imagination may also be used to good advantage in improving inspection procedures and working out further methods of control that may be found necessary during the program of inspection.

The inspector must be extremely thorough in his work, because the entire value of the inspection program rests on his findings. By thoroughness, little things that may seem unimportant will be picked up and corrected before they become a major problem. If the inspection is only superficial, little benefit will be derived and the inspection is without value.

Mr. Munger continues by pointing out that a further qualification for a person making sanitation inspections is that he should be trained to recognize immediately existing conditions and their bearing and relation to the sanitation program. This background should include a thorough knowledge of all the plant operations and their relationship to the operation of the sanitation program. In addition, the inspector should have a working knowledge of the basic biology of the pests that he may encounter. This is quite important because this knowledge may save considerable time and effort in working out a control program. As an example, if insects of the internal feeding type, like the rice weevils, are found somewhere in a plant making cereals, this would indicate that the grain that is being used as the raw material is the source of these insects. On the other hand, the presence of insects such as the confused flour beetle would indicate that these infestations are in such locations where the ordinary cleaning and chemical control measures are having little or no effect. The presence of insects such as the flat grain beetle or meal worms indicates that there are probably locations in the plant that contain damp or out of condition stock, as this is the preferred type of food for these species. By knowing the basic fundamentals of insect life the inspector, at times, may quickly determine the source of trouble and will not have to use long, time consuming methods of locating the primary source of the infestation.

The person that will be making the inspections will need a working knowledge of the chemicals that may be used, since there are things to consider in addition to the actual use to kill pests. Safety, cost, and product contamination all must be considered when using any chemical in a food plant. Knowledge of existing regulations and laws governing food plants with respect to product purity must be considered when planning a pest control program. The knowledge of these regulations will enable the inspector to make his recommendations so that nothing will be undertaken that will conflict with or violate any of these regulations. Safety is very important and should always be kept in mind to protect both himself and all plant personnel.

After a man has been chosen on the basis of these qualifications, he should be placed in such a position so that his work and responsibility are reported directly to the management of the plant rather than to one or a group of individual departments. This direct responsibility to the management should be in turn backed up by the management in all matters. The sanitation program cannot operate as it should without the complete approval and backing of those responsible for the management of the plant.

Before the actual inspections are undertaken, Mr. Munger recommends that it might be helpful to have the inspector visit with other people with the same duties in plants similar to the one in which he is working. This will enable him to better adapt himself for his own work. The inspector should then go over his plant and determine how he will make his inspections. Most plants may be conveniently broken down into various sections and each section may be treated as a separate unit to facili-

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tate thorough and complete inspection procedures, depending on the size of the plant. The inspection may be made at one time, or it may be made section by section. In plants of large size, the inspection made by each section, at one time, will be of value since the inspector will be able to spend an adequate amount of time in each area without feeling that he must move on to the next in order to finish the job by the end of the day.

Inspection Plan

A typical breakdown of the plant for inspection purposes would be to designate the exterior of the plant as a separate part, Mr. Munger suggests. The interior of the plant ordinarily involves more departments and will usually take the most time to make a satisfactory inspection. The interior may be divided into raw material warehouses, finished goods warehouses, manufacturing areas, packaging areas, locker rooms, rest rooms, maintenance or shop areas, cafeteria or lunch rooms, and office areas. Each plant is different and the breakdown will depend upon the size and the number of individual departments in the plant. After the inspection route has been planned, rapid methods of reporting on the various conditions as they are found should be determined, since conditions in the plant may change rapidly. It is important that the findings of the inspector be gathered and any control measures be worked out as soon as possible so as to take full advantage of the time spent in making this inspection. It should be decided which individuals in the plant will get the reports and who will be responsible for seeing that things that need to be done to improve existing conditions are carried out as promptly as possible. Once these procedures have been worked out, the inspector may proceed with his inspection with the assurance that he will receive full cooperation and may expect his findings to produce results. The confidence that he is doing something for the good of the plant is very helpful, as no one enjoys doing a job that is passed off or considered to be of no importance. The sanitation program should certainly be looked upon as being important and the personnel responsible for its operation will do a much better job knowing that their efforts are not in vain, Mr. Munger asserts.

—BREAD IS THE STAFF OF LIFE—

NEW GRAIN ELEVATOR

BENNETTS SWITCH, IND. — A new grain elevator is being built here (near Peru, Ind.) by the Miami County Farm Bureau Co-op, of which Richard Case is manager. It will have a storage capacity of 22,000 bu. It is to be in operation by July 1.

No Advantage In Bromating Temper Water

The procedure of adding potassium bromate to tempering water in advance of milling the wheat has no merit. So concluded three cereal chemists who reported the results of their investigation in a recent issue of AACC Transactions.

Potassium bromate normally is added to flour as a dry ingredient or in solution in the bakeshop. In order to determine the effect of adding bromate to the tempering water, the researchers ran several series of tests with varying amounts of bromate and analyzed the resulting flours for bromate content and the flours were then baked and the bread was compared with bread baked from doughs to whcih bromate had been added during the mixing of the doughs.

It was found that the greater portion of the bromate does not pass through the branny coat of the wheat kernel. Small amounts of bromate, however, do pass into the endosperm and, the researchers said, "it seems probable that it enters at the junction of the bran and germ."

Commenting on the results, the researchers said, "The volume response of flours whose bromate contents originated from additions to the wheat is similar to that of flours improved by addition of bromate at dough mixing, when both are compared on the basis of actual bromate content."

"Bromate added to wheat in the tempering water does pass into the endosperm in small amounts and is milled into the flour," the researchers conclude, adding, "Improvement of such flours is not greater than accounted for by their bromate contents. Since bromate may be added more accurately and conveniently to flours in a dry premix or at dough mixing, the procedure of adding it in the tempering water has no merit."

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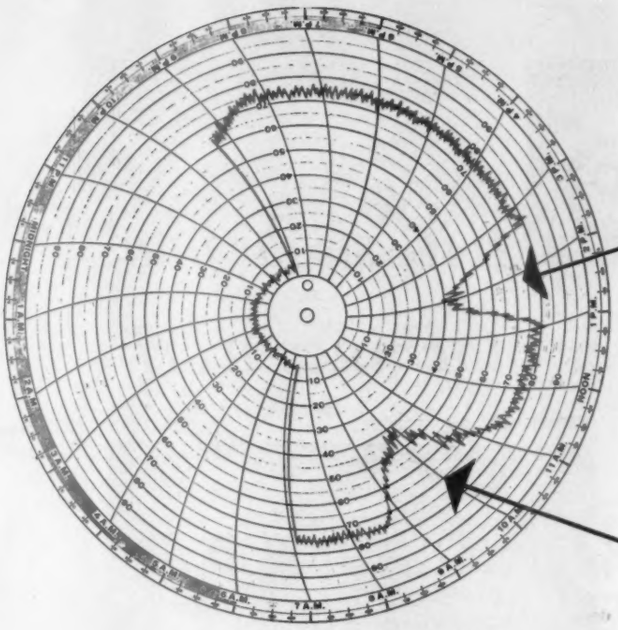

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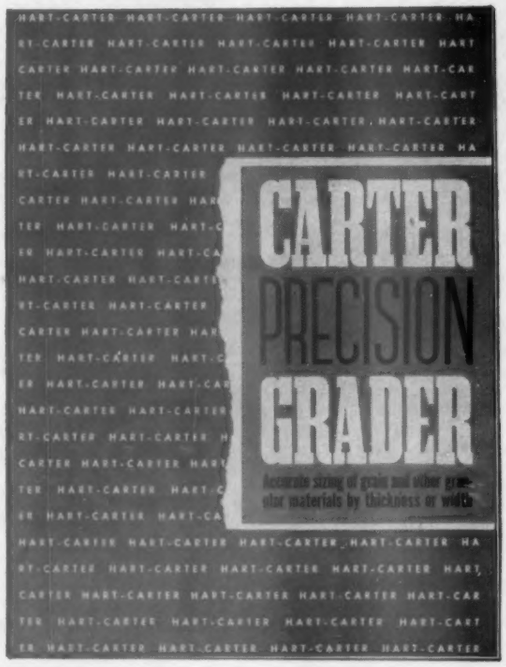

This companion folder describes the operating principles of Carter Precision Graders, which separate and size by *thickness* or by *width* differences. Cylinder shells with slotted perforations separate by thickness. Shells with round recessed perforations separate by width. Ask for Folder CPG-2.

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